The MATHEMATICAL ASSOCIATION of AMERICA
1529 Eighteenth Street, N.W. ▪ Washington, D.C. 20036 ▪ Telephone (202) 387-5200

March 29, 1995

Scientific Officer Code: 311
Dr. Andre van Tilborg
Office of Naval Research
800 North Quincy Street
Arlington, VA 22217-5660

YOUR REF: ONR Grant No. N00014-94-1-0383

To: Andre van Tilborg

From: Marcia P. Sward/mac

At the request of Dr. Marcia Sward, I am enclosing a copy of the performance report, i.e. "Proceedings" for ONR Grant N00014-94-1-0383. The report concerns activities of the 1995 MOSP (Mathematical Olympiad Summer Program) held at the Illinois Mathematics and Science Academy (IMSA) from June 13 to July 12, 1995.

Also enclosed are forms (SF 298) and (SF 269).

Maureen Callanan

Maureen Callanan
Development Assistant

CC with encs.:

Grant Administrator/Resident Representative N66020, Atlanta GA
(Attn: Charles K. Hayes)
DTIC/Alexandria, VA

THIS DOCUMENT WITH ATTACHMENTS ALSO FAXED TO CHARLES K. HAYES ON MARCH 29, 1996 AT (404) 730-9260.

Fax (202) 265-2384 E-mail maahq@maa.org

REPORT DOCUMENTATION PAGE

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Dr. Titu Andreescu, Director of MOSP

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The Mathematical Association of America (MAA)
1529 Eighteenth Street, N.W.
Washington, DC 20036

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13. ABSTRACT *(Maximum 200 words)*

Technical Objective:
The objective is to prepare a team of U.S. high school students to compete in the International Mathematical Olympiad (IMO) held in Toronto, Canada, July 19-20, 1995. Those selected are introduced to a wide range of mathematical problems and theory at the Mathematical Olympiad Summer Program (MOSP) held for the first time in 1995 at the Illinois Mathematics and Science Academy (IMSA).

The U.S. Team placed 11th among the 74 competing countries with team members earning 6 medals.

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FINANCIAL STATUS REPORT

(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is submitted	2. Federal Grant or Other Identifying Number Assigned By Federal agency	OMB Approval No. 0348-0039	Page	of
Office of Naval Research	N 00014-94-1-0383		1	1 pages

3. Recipient Organization (Name and complete address, including ZIP code) **THE MATHEMATICAL ASSOCIATION OF AMERICA**
1529 18th STREET NW
WASHINGTON DC 20036

4. Employer Identification Number	5. Recipient Account Number or Identifying Number	6. Final Report	7. Basis
16-0743079	2212	XX Yes ☐ No	XX Cash ☐ Accrual

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1-1-95	12-31-95	1-1-95	12-31-95

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	43,844	---	43,844
b. Recipient share of outlays	-	-	-
c. Federal share of outlays	43,844	---	43,844
d. Total unliquidated obligations			-
e. Recipient share of unliquidated obligations			-
f. Federal share of unliquidated obligations			-
g. Total Federal share *(Sum of lines c and f)*			43,844
h. Total Federal funds authorized for this funding period			43,844
i. Unobligated balance of Federal funds *(Line h minus line g)*			0

11. Indirect Expense	a. Type of Rate *(Place "X" in appropriate box)* ☐ Provisional ☒ Predetermined ☐ Final ☐ Fixed			
	b. Rate	c. Base	d. Total Amount	e. Federal Share
	33%	35,000	8,844	8,844

12. Remarks: *Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.*

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
Marcia P. Sward, Executive Director	202-387-5200
Signature of Authorized Certifying Official Marcia P. Sward	**Date Report Submitted** 3/27/96

Previous Editions not Usable

Standard Form 269A (REV 11-90)
Prescribed by OMB Circulars A-102 and A-110

The 1995 Mathematical Olympiad Summer Program Report

The 1995 Mathematical Olympiad Summer Program (MOSP) was held at the Illinois Mathematics and Science Academy (IMSA) from June,13 to July,12. It was the first time in 22 years that the program was hosted by an institution other than the Service Academies (The United States Military Academy in West Point, New York and the Naval Academy in Annapolis, Maryland). Located in Aurora, IMSA is the state's public residential high school for talented mathematics and science students in grades 10-12. IMSA also serves as an educational laboratory for developing and testing innovative programs to share with other school systems, teachers and students in Illinois and across the country.

The main goals of the Mathematical Olympiad Summer Program are:

1. To provide a quality mathematics program for 24-30 very promising students who have risen to the top on contests. It shall insure interest in mathematics, broaden students' view of mathematics and better prepare them for possible participation on our IMO team. The program shall also provide the best example of the way mathematics instruction should be carried out.

2. To identify from among the participants in each given summer a USA IMO team. To coach this team to its highest level of performance in the IMO, and to achieve an atmosphere of comradeship and cooperation among the team and other participants.

Twenty-four students were invited to participate in the 1995 MOSP (23 males and 1 female). Titu Andreescu was the Director of the program. Paul Zeitz and Elgin Johnston were the assistant directors. Kiran Kedlaya, Lenny Ng and Stephen Wang served as student assistants. Prof. Walter Mientka, the Executive Director of the American Mathematics Competitions, who accompanied the instructors and the six IMO team members on their trip from the Washington DC USAMO Ceremonies to Aurora, the MOSP site, spent a day at IMSA and gave the opening lecture, a very interesting and inspiring presentation of Morley's Theorem.

The instructional program was structured such that it addressed constantly at least two levels (introductory, advanced and, in its final part, the IMO team). The "official" lectures were given at 9, 11 and 1pm, Monday through Friday. In addition, assistant and student lectures were given at various hours, including weekends. Students took 13 MOSP and additionally (for the IMO team and other students who expressed interest) 5 IMO tests. They were further assigned and turned in 2 MOSP and 1 IMO weekly problem sets. Two team contests and a student mathematical marathon were also designed.

This very intense academic program was balanced by two long trips to Chicago

(Museum of Science and Industry, Lake front, Taste of Chicago) and State's Park (Starving Rock), three short ones: Geneva Park, Fox Valley Mall, Fox Valley Movie Theater (Pocahantas) and by various athletic activities such as the daily ultimate frisbee, the basketball and the ping-pong tournaments.

The program was visited by Dr. Marcia Sward, the Executive Director of the MAA and by Dr. Richard Gibbs, chair of the Committee on the American Mathematics Competitions. They inspected the facilities, both academic and residential and met with the students and the instructors in a two-hour very interesting and useful open discussion. Dr. Sward met with Dr. Stephanie Pace Marshall, IMSA's Executive Director. Dr. Gibbs gave an interesting lecture about the Square-cube property.

Dr. Don Coppersmith was, again, our invited lecturer this year, through a generous IBM grant. He talked about "Polynomials whose powers are sparse". His presentation was very well received by the entire audience.

Two visiting lecturers, Asuman Oktac and Xiaodi Wang gave 2 lectures each in the last academic day of the program.

Despite the fact that the USA 1995 IMO team did not repeat the 1994 IMO performance, it appeared evident that the 1995 MOSP was the most successful ever. We have a strong inclination that the outstanding MOSP '95 work will pay dividends in 1996 and the following years.

Titu Andreescu, Director, The Mathematical Olympiad Summer Program

AMERICAN MATHEMATICS COMPETITIONS

1995 MATHEMATICAL OLYMPIAD SUMMER PROGRAM

JUNE 13 - JULY 12, 1995

LIST OF PARTICIPANTS

Carl J. Bosley (913) 862-9956	6825 SW Windsong Drive	Topeka, KS 66619-1301
Christopher C. Chang (415) 494-6790	715 Charleston Ct.	Palo Alto, CA 94303
Li-Chung Chen (408) 253-5992	1194 Crestline Drive	Cupertino, CA 95014
Jay H. Chyung (319) 351-7437	13 Woodland Heights NE	Iowa City, IA 52240
John J. Clyde (208) 278-5678	PO Box 338	New Plymouth, ID 83655
Nathan G. Curtis (703) 709-9072	1255 Center Harbor Place	Reston, VA 22094
Jonathan K. Fisher (615) 647-6583	527 Idlewood Drive	Clarksville, TN 37043
Michael H. Freiman (215) 247-9033	7902 Lincoln Drive	Philadelphia, PA 19118
Andrei C. Gnepp (216) 464-3549	3968 East Ash Lane	Orange Village, OH 44122
Daniel B. Johnston (515) 232-8544	840 Brookridge Ave.	Ames, IA 50010
Stefan G. Kazachki (919) 876-8224	725 Purdue St.	Raleigh, NC 27609
Aleksandr L. Khazanov (718) 436-9537	679 Ocean Parkway #6A	Brooklyn, NY 11230
Travis J. Kopp (303) 979-6455	11219 W. Stanford Ave.	Littleton, CO 80127
Michael R. Korn (612) 490-1973	32 Bridgewater Drive	Vadnais Heights, MN 55127
Eric H. Kuo (412) 372-6622	208 Meadow Drive	Trafford, PA 15085
Jacob A. Lurie (301) 229-3059	6611 Braeburn Parkway	Bethesda, MD 20817
Davesh Maulik (516) 626-7957(8)	39 Hummingbird Dr.	East Hills, NY 11576
Josh P. Nichols-Barrer (617) 244-8421	24 Hazelton Rd.	Newton, MA 02159
Alexander H. Saltman (512) 451-1665	721 Park Blvd.	Austin, TX 78751

Daniel A. Stronger (718) 225-3445	63-12 252 St.	Little Neck, NY 11362
Aaron M. Ucko (816) 822-8052	1007 W. 66th St.	Kansas City, MO 64113-1815
Lauren K. Williams (310) 378-9615	1624 Cataluna Place	Palos Verdes Estates, CA 90274
Kevin M. Woods (404) 972-8228	3341 Rae Place	Lawrenceville, GA 30244
Donald J. Ying (408) 243-6221	4715 Malero Place	San Jose, CA 95129

STAFF

Director	Associate Director	Associate Director
Mr. Titu Andreescu Illinois Math & Sci Academy 1500 W Sullivan Rd Aurora, IL 60506 (708) 907-5964	Prof. Paul Zeitz Dept. of Mathematics Univ. of San Francisco San Francisco, CA 94117-1080 (415) 666-6590	Prof. Elgin Johnston Dept. of Mathematics Iowa State University Ames, IA 50011 (515) 294-7294
Student Assistant	**Student Assistant**	**Student Assistant**
Kiran Kedlaya 12912 Georgia Ave. Silver Spring, MD 20906 (301) 946-5604	Lenhard Ng 1107 Roosevelt Drive Chapel Hill, NC 27514 (919) 942-3931	Stephen S. Wang 4N804 Grandma's Lane St. Charles, IL 60175 (708) 377-0988

# # # # # # # # # # # # # # # # #

American Math Competitions
(402) 472-2257
Math Association of America
(202) 387-5200

Dr. Walter E. Mientka, Secretary
International Mathematical Olympiad Advisory Board
University of Nebraska
Lincoln, Nebraska 68588-0658
U.S.A.
eMail: walter@amc.unl.ed Bitnet: walter@unlamc FAX: 1- 402-472-6087 Tel: 1-402-472-5114

	TUESDAY JUNE 13	
9		
11		
2	ARRIVAL	

	THURSDAY JUNE 15	
	Level I	Level II
9	T, L,S Introduction to Writing Proofs	
11	L,S Writing Proofs	
2	P Generating Functions	E Generating Functions

	MONDAY JUNE 19	
	Level I	Level II
9	P Combinatoric Identities	E Combinatoric Identities
11	T Triangles	P Pigeonhole Principle
2	E Pigeonhole Principle	T Plane Geometry

	WEDNESDAY JUNE 21	
	Level I	Level II
9	E Inclusion-Exclusion	P Congruence
11	T Transformations II	E Inclusion-Exclusion
2	P Congruence	T Transformations II

	FRIDAY JUNE 23	
	Level I	Level II
9	E Fixed Point Theorems	P Graph Theory II
11	T Diophantine Equations	E Fixed Point Theorems
2	P Graph Theory II	T Diophantine Equations

	TUESDAY JUNE 27	
	Level I	Level II
9	P Combinatorial NT	E Inversive Geometry I
11	T Circles. Radical Axis	P Combinatorial NT
2	E Inversive Geometry	T Circles. Radical Axis

	THURSDAY JUNE 29	
	Level I	Level II
9	P Algorithmic Proofs	E Analytic Geometry
11	T Polynomials II	P Algorithmic Proofs
2	E Analytic Geometry	T Polynomials II

	MONDAY JULY 3	
	Level I	Level II
9	P Combinatorial Geometry	E Inequalities
11	T Trigonometry I	P Combinatorial Geometry
2	E Inequalities	T Trigonometry I

	WEDNESDAY JUNE 14	
	Level I	Level II
	W, T, P, E, L, S	Introduction
	W	Morley's Theorem
	T, L, S	Homework Discussion

	FRIDAY JUNE 16	
	Level I	Level II
	P Generating Functions II	E Generating Functions II
	T Telescoping Sums&Prod	P Combinatoric Arguments
	E Combinatoric Argumen s	T Telescoping Sums&Prod

	TUESDAY JUNE 20	
	Level I	Level II
	E Transformations I	P Theory of Equations
	T Induction	E Transformations I
	P Theory of Equations	T Induction

	THURSDAY JUNE 22	
	Level I	Level II
	P Graph Theory I	T Triangles
	E Conics	P Graph Theory I
	T Plane Geometry	E Conics

	MONDAY JUNE 26	
	Level I	Level II
	E Linear Algebra	P Additive Problems in NT
	T Extremal Arguments	E Linear Algebra
	P Additive Problems in NT	T Extremal Arguments

	WEDNESDAY JUNE 28	
	Level I	Level II
	T Inversive Geometry II	E Polynomials I
	E Polynomials I	P Quadratic Reciprocity
	P Quadratic Reciprocity	T Inversive Geometry II

	FRIDAY JUNE 30	
	Level I	Level II
	K Pascal-Brianchon Th ns	T Functional Equations
	E Non-IMO Talk	K Pascal-Brianchon Thms
	T Functional Equations	P Non-IMO Talk

	TUESDAY JULY	
	Level I	Level II
	E Vector Geometry	P Probability
	T Trig. and Application s	E Vector Geometry
	P Probability	T Trig. and Applications

	WEDNESDAY JULY 5	
	Level I	Level II
9	T Geometric Inequalities	E Complex Nos. in Geom.
11	E Complex Nos in Geom.	P Ramsey's Theorems I
2	P Ramsey's Theorems I	T Geometric Inequalities

	THURSDAY JULY 6	
	Level I	Level II
	T Recurrence Relations I	E Approximations
	P Ramsey's Theorems II	T Recurrence Relations I
	E Approximations	P Ramsey's Theorems II

	FRIDAY JULY 7	
	Level I	Level II
9	K Projective Geometry	T Recurrence Relations II
11	E Non-IMO Talk	K Projective Geometry
2	T Recurrence Relations II	P Non-IMO Talk

	MONDAY JULY 10	
	Level I	Level II
	X Odd and Even Numbers	A Euclidean Constructions
	A Euclidean Constructions	X Odd and Even Numbers
	ST	UDENT TALK

	TUESDAY JULY 11	
	Level I	Level II
9	X The Symmetry Method	A Invariants
11	A Invariants	X The Symmetry Method
2	STUDENT TALK	

	WEDNESDAY JULY 12	
	Level I	Level II
	DE	PARTURE

A Asuman(visitor)
E Elgin(assoc. dir.)
K Kiran(assistant)
L Lenny(assistant)
P Paul(assoc. dir.)
S Stephen(assistant)
T Titu(director)
W Walter(exec. dir. AMC)
X Xiaodi(visitor)

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1529 EIGHTEENTH STREET NW • WASHINGTON, DC 20036 • 202/234-9570 • FAX 202/462-7877 • jpbm@math.umd.edu.

NEWS

FOR IMMEDIATE RELEASE
Mailed: July 25, 1995

Contact: Kathleen Holmay
301-942-9595

U.S. TEAM TAKES SIX MEDALS AT INTERNATIONAL MATH OLYMPIAD
-Places 11th Among 74 Participating Countries-

(Washington, DC).....Each of the six members of the U.S. team won medals at the 36th International Mathematics Olympiad in Toronto, Canada on July 19 and 20. The U.S. team placed 11th among the record number of 74 countries that participated. The top 12 teams were China, Romania, Russia, Vietnam, Hungary, Bulgaria, South Korea, Iran, Japan, United Kingdom, U.S.A. and India.

Aleksandr L. Khazanov, Brooklyn, NY, Jacob A. Lurie, Bethesda, MD, and Josh P. Nichols-Barrer, Newton Center, MA won silver medals. Khazanov and Lurie were members of last year's U.S. IMO team which received a perfect score for the first time in IMO history.

Christopher C. Chang, Palo Alto, CA, Jay H. Chyung, Iowa City, IA, and Andrei C. Gnepp, Orange, OH, won bronze medals. The six U.S. winners received their medals at the IMO closing awards presentation on July 24.

U.S. team members were selected based on their performances in the twenty-fourth annual USA Mathematical Olympiad held in April of this year. The U.S. team had four weeks of intensive training at the Illinois Academy of Math and Science in Aurora, IL before traveling to Toronto.

(more)